ABSTRACT

This paper discusses the implementation of a Structural Health Monitoring system for a FRP bridge structure using vibration-based monitoring techniques. The need to monitor the long-term performance of fiber reinforced polymer (FRP) composite bridge structures prompted the installation of a vibration-based structural health monitoring system on a recently-built FRP composite highway bridge in California. Using output-only methods, ambient excitation can be used to excite the structure and the structure can remain in its operational condition during the test – a procedure well suited for long-term Structural Health Monitoring system where the condition of structures must be evaluated during its normal operations. Two frequency domain output-only techniques: Frequency Domain Decomposition (FDD) and Operational Deflection Shape FRF (ODS FRF) method were used in this study. Their comparative strength and weakness were discussed in this context. The modal parameters generated can then be used as input for damage detection algorithms and the change of structural performance due to time-based deterioration and other irregularities can be monitored. The results are made available to the California Department of Transportation via a web-based interface, enabling appropriate action to be authorized for preliminary maintenance or emergency response prior to actual onsite inspection.

Key Words: SHM, FRP Composites, Ambient Vibration, Modal Analysis